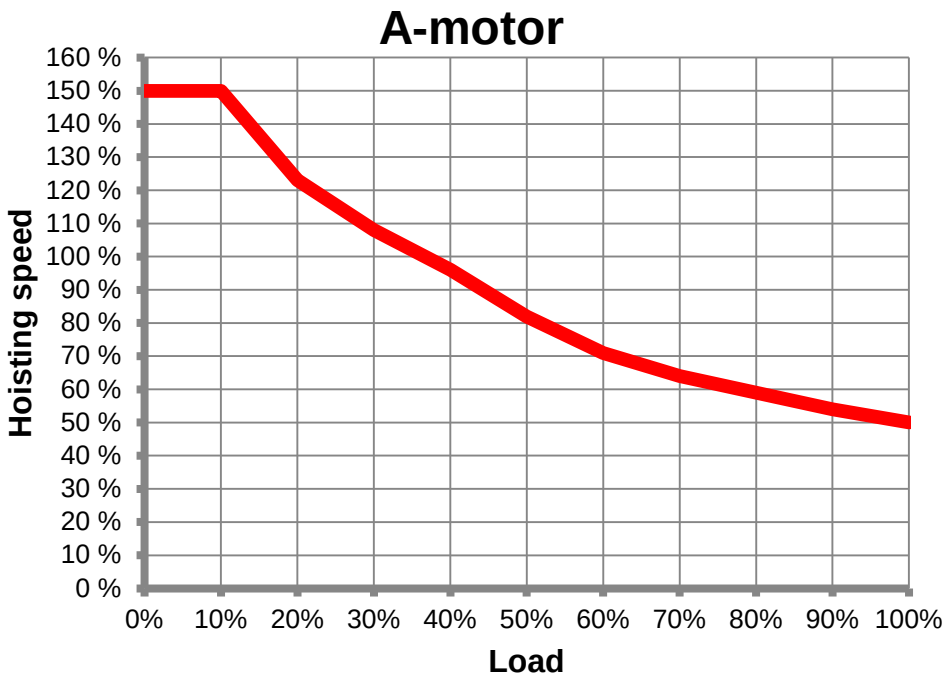
Inverter Technology

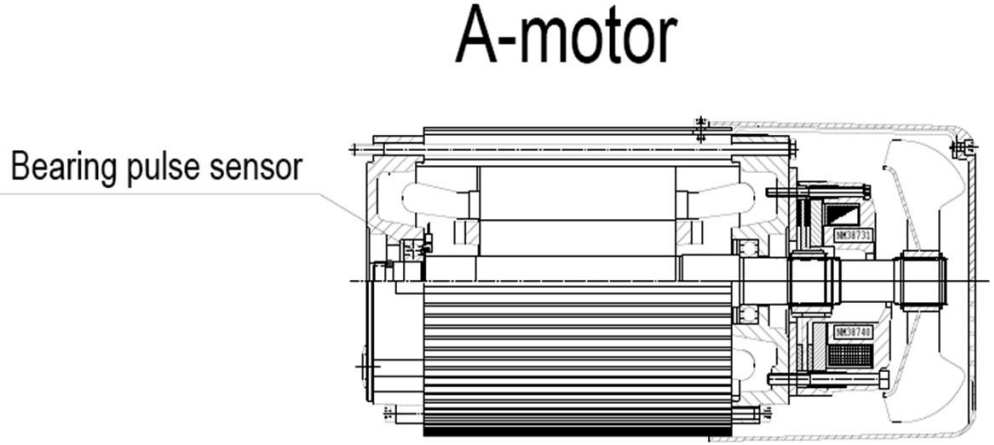
A Motor

A Motor Technology
At a Glance



- Lifting speed optimized for load:
  - Fast speed with empty hook
  - Medium speed with partial loads
  - Safety speed with full load
- Hoist motor power rated 50% of dual speed motors
- Four configurations:
  - A3 – 2.3 kW (NB + NC)
  - A5 – 4.5 kW (ND)
  - A7 – 9.0 kW (NE)
  - 2xA7 – 2x 9.0 kW (NF)
- Inverter location:
  - Integrated in hoist cubicle up to ND
  - Installed on crane bridge for NE, NF

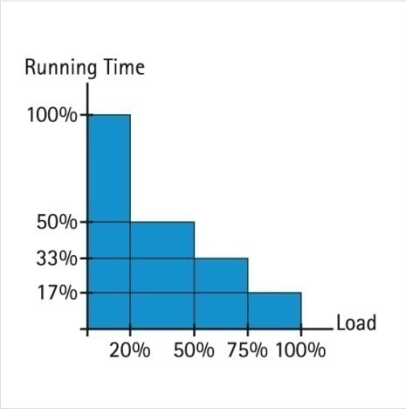
A Motor Technology
At a Glance



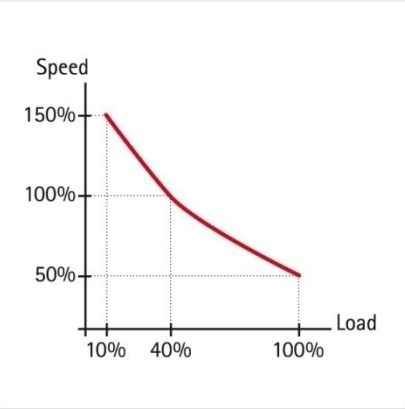
- Open loop
  - Bearing sensor
- Protection class IP66
- Class H insolation
- Speed range:
  - 25:1 with empty hook
  - 10:1 with rated capacity

A Motor Technology

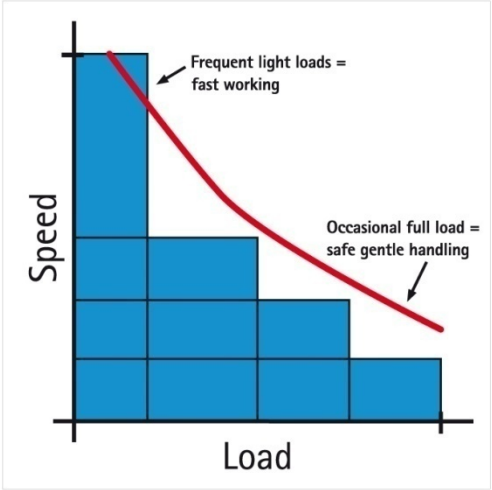
Load Spectrum and Speed



Average capacity utilization of an industrial crane



A motor characteristics

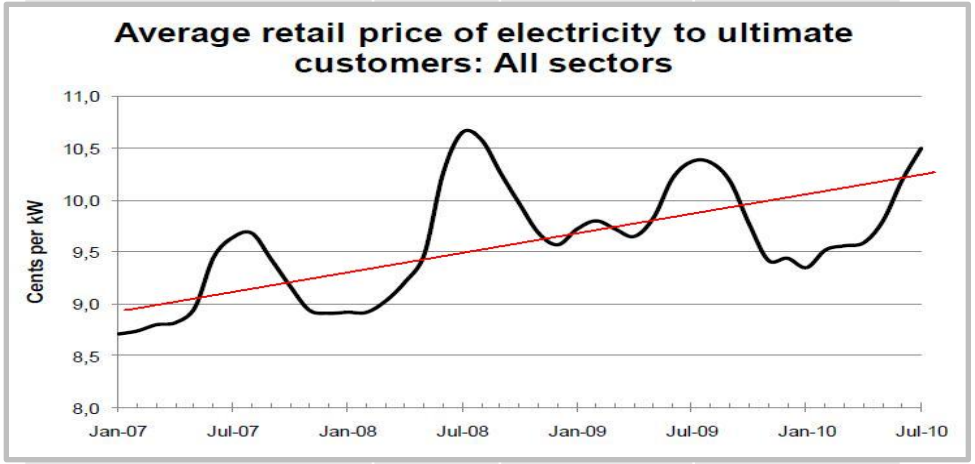


BENEFITS

- Safety speed for gentle handling heavy loads
- Fast throughput of light loads increases productivity
- Reduced energy consumption
- Less downtime
- Reduced wear and tear
- Lower cost of ownership

A Motor Technology
Low Energy Consumption

10 ton hoist		"A“ motor	Dual speed motor
Lifting speed	m/min	0.25...2.5 (7.5)	1 / 6
Motor output	kW	4.5	9.0
Lifecycle cost	**€**	**~1,000€**	**~2,000€**



- A” motors save energy and cost
- Load-sensitive speeds reduce the required installed motor output
- Inverter technology reduces amperage peaks when switching on the motor
- **Not relevant?**

BENEFITS

- Up to 50% energy cost savings, compared to traditional dual speed technology

A Motor Technology
Faster Handling of Loads

Results		"A" motor	Dual speed motor
Lifting speed	m/min	0.25...2.5 (7.5)	0.8 / 5.0
Load spectrum	-	Light/medium	Light/medium
Average height (lifting + lowering)	m	1 + 1	1 + 1
Empty hook travel	%	50	50
Loaded hook travel	%	50	50
Handling time, crane 1	min	2,244	2,992
Handling time, crane 2	min	2,407	
Average time required	min	2,325	
Time saving		**22%**	

- A motors increase productivity in typical production processes:
  - Faster with light load / empty hook
  - Heavy goods are handled precisely
- A detailed analysis of the work cycles of two cranes in an assembly area proved significant time savings, compared to dual-speed technology

BENEFITS

- Significant reduction of handling time
- Increased productivity

A Motor Applications
General Manufacturing

- Typical material handling process:
  - **In:** 200 light components and raw material deliveries per week
  - **Out:** 5 heavy machines per week
- Requirements:
  - Rapid unloading and handling of incoming raw materials
  - Safe lifting of completed machines

BENEFITS

- Time savings in handling light loads
- Gentle handling of valuable finished goods at end of assembly line
- Precision speed does not produce excessive heat: extended motor lifetime

A Motor Applications
Precast Concrete

- Typical material handling process:
  - Regular lifts of moulds & steel bars
  - Lifting of heavy precast elements
- Requirements:
  - Precise lifting of precast parts out of mould with slower speeds for a longer period of time
  - Fast handling of moulds, steel bars

BENEFITS

- Increased productivity
- Time savings due to reduced down-time
- Increased lifetime of motor, compared to dual speed motors with 20% ED in slow speed
- Avoids main/micro motors

A Motor Applications
Additional Crane on Runway

10 ton hoist		"A" motor	Dual speed motor
Speed	m/min	0.25...2.5 (7.5)	1/6
Motor output	kW	4.5	9.0
Existing 5t motor	Amps	10	10
New 10t motor	Amps	25	100
Total current	Amps	35	110
Runway length	m	50	50
Supply voltage	V	400	400
Voltage drop	%	3,0	3,0
Copper cross section	mm²	15	25
Runway electrification	**€**	**0€**	**~3,000€**
Downtime	**hours**	**0**	**?**

- One 5 t crane exists on a 50 m runway (conductor bar 60 Amps, end feed, 15 mm² copper cross section)
- Customer identified increased production volumes and heavier loads
- Customer requirements:
  - Addition of a 10 t crane on same runway
  - Minimum downtime during installation
  - No changes in existing electrification

BENEFITS

- Low amperage of motor permits to use existing runway electrification
- Minimum down-time in production
- No additional investments
- "A" motor technology, not requiring replacement of runway electrification or other changes.

A Motor Applications
Multi Crane Projects

3 x 20 ton hoist		"A“ Motor	Dual speed motor
Speed	m/min	0.25...2.5 (7.5)	0.5 / 3.0
Motor output	kW	3 x 9	3 x ~13
Daily usage	hours	1	1
Annual workdays	days	240	240
Crane lifetime	years	10	10
Lifecycle energy consumption	kWh	65,000	94,000
Cost per kWh	€/kWh	~0,10	~0,10
Energy lifecycle cost	**€**	**~6,500€**	**~9,400€**
Total amperage	A	72	177
Required cross section	mm²	15	35
Runway electrification	**€**	**~4,000€**	**~7,000€**

- Investment in a new factory building:
  - Three bridge cranes, each rated 20 ton
  - Common runway, 100 m (center feed)

BENEFITS

- 30% energy cost savings, compared to traditional dual speed technology
- Significantly lower investment in runway electrification